THE RELATIONSHIP OF GENDER DIFFERENCE IN EDUCATION TO ECONOMIC GROWTH: A CROSS-COUNTRY ANALYSIS

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Abstract

The objectives of this study were: (1) To explore the cross-country relationship of gender gap in literacy levels and in enrollment rates to per capita GNP growth. (2) To find out whether the relationship of gender gap to economic growth in the countries of OPEC (Organization of Petroleum Exporting Countries) and/or the EAC (East Asian Countries) differs at a statistically significant level from that of the other countries under investigation due to socio-economic structural differences. Linear and linear-log regression models were used for the analysis. Dummy intercept shifters were included into the regressions to measure the effects of OPEC and EAC. Results showed that: (1) The relationship of narrowing literacy and enrollment gender gaps, at primary or secondary levels, to per capita GNP growth were positive and statistically significant. And (2) the effect of the OPEC dummy was negative on the intercept of the estimated regression lines, while the effect of the EAC dummy was positive. Both of the estimated OPEC and EAC effects were statistically significant. Further research on the possible socio-economic factors that might have inhibited the income growth in OPEC countries was suggested.

ملخص

كانت أهداف هذه الدراسة هى ١) بحث علاقة نصيب الفرد من الناتج القومى الاجمالى بالفجوة فى مستويات التعليم ومعدلات الالتحاق بالتعليم بين الجنسين، و٢) البحث فيما إذا كان للعلاقة بين النمو الاقتصادى والفجوة بين الجنسين أية دلالة احصائية فيما بين دول منظمة الأقطار المصدرة للنفط (الاوبك) و/أو دول شرق آسيا من جهة وبين بقية الدول الأخرى التى يتم بحثها من جهة أخرى، وذلك من منظور اختلاف الهيكل الاجتماعى-الاقتصادى. وقد تم استخدام نماذج انحدار خطية وخطية لوغاريتمية فى التحليل. وتم تضمين الانحدار متغيرات تعارض صورية بهدف قياس آثار دول الاوبك وشرق آسيا. وقد أظهرت النتائج بأن: ١) علاقة تضييق الفجوة بين الجنسين فى التعليم وفى الالتحاق به فى المرحلتين الابتدائية والاعدادية وبين نمو نصيب الفرد فى الناتج القومى الإجمالى كانت ايجابية وذات دلالة احصائية. ٢) أن أثر المتغيرات الصورية للاوبك كان سالباً على تعارض خطوط الانحدار المقدرة، بينما كان أثر المتغيرات الصورية لدول شرق آسيا ايجابياً. وقد كانت للتأثيرات المقدرة لكل من دول الاوبك وشرق آسيا دلالة إحصائية. وقد اقترحت الدراسة القيام بالمزيد من البحث حول العوامل الاجتماعية-الاقتصادية التى قد تكون السبب فى كبح نمو الدخل فى دول الاوبك.

INTRODUCTION

Numerous studies have been conducted on the relationship of education[2] to economic growth. The overwhelming results of these studies have shown a positive relationship between the level of education and the level of economic growth. A summary of these are shown in Tilak (1989). Some studies have also been carried out on the relationship of women education to economic growth and development. One of the dimensions of these studies has been the relationship of declining gender gap to economic growth and development (World Bank, 1993 ; and Hill and King, 1993).

World Bank (1993, pp. 43-47 and 75) demonstrated the cross-country relationship of the gender gap to economic growth. To do this, the ratio of male-to-female enrollment rates were regressed versus per capita income for both primary and secondary level of education. The results of the report show that gender gap decreases as per capita income increases. And for East Asian economies, gender gap has been narrowed much more quickly than expected at their level of income. The report (p. v) states that most of East Asia's extraordinary economic growth, in the past three decades, has been due to superior accumulation of physical and human capital. And that the declining gender gap has been one the effective factors that has led to the fast economic growth of these countries. Hill and King (1993, pp. 11-34) explained positive effects of narrowing gender gap on per capita income growth and economic development. These effects were shown by comparing the regression lines for the two groups of countries that had high and low gender gap ratios. Other manuscripts such as Rajeeve (1990, pp. 63 and 67) demonstrated the education gender disparities simply by comparing the percentages of the enrollment rates of male and female. Inspite of the previous research, further studies have been recommended to clarify and debate on the methods used and the conclusions drawn about the women's education including the relationship of gender gap to economic growth and development (World Bank 1993 p. V; and King and Hill, 1993 p. XII).

The general objective of this study is to shed more light upon the relationship of education gender gap to economic growth. By gender gap in this study it is meant there is a difference between literacy levels of male and female population or between their enrollment rates at primary or secondary level. The way of measuring gender gap will be mentioned later under methodology section. The more specific objectives of this study are: (1) To explore the cross-country relationship of gender gap in literacy levels and in enrollment rates to per capita GNP growth. And (2) to find out whether the impacts of gender gap on economic growth differs at a statistically significant level for the Organization of Petroleum Exporting Countries (OPEC) and/or for the East Asian Countries (EAC) from that of the other countries under investigation due to economic structural differences. The names of the countries that are included in the OPEC and EAC categories are mentioned later under equation (1) and (2). OPEC countries were included in the analysis because they have relied heavily on the revenue obtained from exporting oil and have had discouraging negative per capita income growth between 1980 to 1989, with the exception of Algeria with zero and Indonesia with 3.6 percent growth (Reimer and Tiburcio, 1993 pp. 89-90). EAC were included because, as mentioned before, they have experienced a rapid per capita income growth in the past three decades. It should be mentioned that in this analysis Indonesia is the only country that falls in both OPEC and EAC categories.

Few characteristics of the OPEC and EAC economies are shown in appendix Table A1 and Table A2. The figures for each of the mean values of per capita GNP growth, the enrollment rates, and the ratios of female-to-male enrollment rates vary depending upon the year and the number of the countries in the samples. The following few points, however, can be summarized from these two Tables: (1) The means of per capita GNP growth for the total samples were around zero and varied between -0.44 to 0.10, for OPEC they varied between -3.47 to -2.51, and for EAC variation was between 3.10 to 4.98. That is, the OPEC performance in terms of per capita income growth has been the reverse of that of EAC economies. (2) The mean values of literacy levels and the enrollment rates of OPEC are smaller than those of the total samples[3], while for EAC these values are larger. (3) The means of female-to-male ratios of literacy levels and enrollment rates for OPEC were smaller than those of the total samples; and for EAC larger[4], with the exception of the ratio of enrollment rates in 1955.

MATERIALS AND METHODS

A linear regression model was used on cross-country data to estimate the relationship of gender gap to economic growth. Dummy variables were included in the model to estimate the possible shifts in the intercept of the equations for the two categories of countries, OPEC and EAC.

Growth of per capita GNP in constant terms was taken as the dependent variable throughout the study. The quantitative explanatory variable was education gender gap. That its proxy measures were the ratio of female-to-male of either literacy levels or enrollment rates -- the smaller the ratios the larger is the gender gap. The qualitative variables included two dummies for OPEC and EAC. This analysis generally included two parts: (1) estimating the relationship of the literacy gender gap to per capita GNP growth, and (2) estimating the relationship of enrollment gender gap to per capita GNP growth. The linear regression equation used for the estimation with respect to literacy gender gap was as follows:

$$Q_i = a_0 + b_1 G_{li} + b_2 D_{2i} + b_3 D_{3i} + u_i \qquad (1)$$

where:

Q_i = per capita GNP growth in constant terms between 1980 to 1989 and measured in U.S. Dollars for country i.

G_{li} = gender gap of literacy level for country i in year 1970, measured as the ratio of female-to-male literacy levels. And the literacy level measured as the percentage of literate persons from age 15 and up for most of the countries under investigation.

D_{2i} = dummy variable, with a value of one for the OPEC countries included in this study (Algeria, Gabon, Libyan Arab Jamahiriya, Nigeria, Ecuador, Venezuela, Indonesia, The Islamic Republic of Iran, Kuwait, Saudi Arabia, and The United Arab Emirates) and of zero for

the other countries.

D_{3i} = dummy variable, with a value of one for the EAC countries included in this study (Hong Kong, Japan, Malaysia, Singapore, Indonesia, Republic of Korea, Philippines, and Thailand) and of zero for the other countries.

i = 1, 2, ..., 89 are the numbers of 89 countries, see footnote 5.

a_0 = intercept for equation (1).

$b_1..b_3$ = regression coefficients for equation (1).

u_i = regression residual for country i in equation (1).

The linear regression equation used for the estimation of the relationship of the enrollment gender gap to per capita GNP growth was as follows:

$$Q_i = à_0 + á_1 G_{ci} + á_2 D_{2i} + á_3 D_{3i} + u_i \qquad (2)$$

where:

Q_i, D_2, and D_3, were the same as equation (1), with the exclusion of United Arab Emirates for D_3.

G_{ci} = gender gap of enrollment rate (gross) for country i, measured as the ratio of female-to-male enrollment rates. and the enrollment rates measured as percentage of school age population actually enrolled.

$à_0$ = intercept for equation (2).

$á_1..á$ = regression coefficients for equation (2).

u_i = regression residual for country i in equation (2).

The gender gap of enrollment rate, G_{ci}, was applied in separate regressions to the first and second levels of schooling for the years 1950, 1955, 1960, and 1965. Due to data constraint, the number of observations (countries) using equation (2) differed for each year and level of schooling. At any rate, the sample countries were selected from 93 countries as explained in footnote 5.

The linear regression equation (2) was repeated in linear-log function form as follows:

$$Q_i = à_0 + á_1 \ln G_{ci} + á_2 D_{2i} + á_3 D_{3i} + u_i \qquad (3)$$

where all of the components of the equation are the same as equation (2) with the exception of $\ln G_{ci}$ that is substituted for G_{ci} -- and $\ln G_{ei}$ is the natural logarithm of G_{ci}.

Regression results were compared according to their estimated F ratios, their R^2, and their Durbin-Watson statistics for the whole regressions, as well as to the signs and values of the t statistics of the estimated partial regression coefficients.

The data used for per capita GNP growth were for 1980 - 1989 and were taken from Reimers and Tiburcio (1993, pp. 89-90). The data used for literacy levels that were for 1970 (the year that data were available for) and for enrollment rates that were for 1950, 1955, 1960, and 1965 were taken mainly from published figures in different years of the UNESCO Statistical Yearbook. Among few other complimentary sources of data were the Statistical Yearbook of The Islamic Republic of Iran, from which data on Iran's per capita GNP were calculated. OPEC and EAC were listed from the PC Globe 5.0 Package. Ninety nine countries[5] were included in this study. However, for each regression, only the countries that had the needed data were included. Consequently, the number of observations of the estimated regressions varied accordingly.

RESULTS AND DISCUSSION

A. The relationship of Literacy Gender Gap to Economic Growth

The results calculated from equation (1) used to estimate relationship of literacy gender gap to economic growth are shown in regression equations (4) and (5) as follows:

$$Q_i = -1.9438^{**} + 2.8654^{***}G_{li} \quad (4)$$
$t =$ (-2.62) (2.71)
$R^2 = .078$, $\bar{R}^2 = .067$, $F = 7.38^{***}$, $df = 1, 87$
Standard Error of Estimate = 3.1204
Durbin-Watson statistic = 1.47, k,n = 1, 89

$$Q^i = -1.1865^{*} + 1.6414^{*}G_{li} - 3.0055^{***}D_{2i} + 4.2484^{***}D_{3i} \quad (5)$$
$t =$ (-.71) (1.71) (-3.33) (4.11)
$R^2 = .301$, $\bar{R}^2 = .277$, $F = 12.22^{***}$, $df = 3, 85$
Standard Error of Estimate = 2.7483
Durbin-Watson statistic = 1.576^{**}, k,n = 3, 89
***, **, and * in equations (4) and (5) represent 1, 5, and 10% level of significance respectively.

The estimated results shown in equations (4) and (5) indicate that narrowing literacy gender gap G_{li} has had significantly positive relationship to per capita income growth. As mentioned before, literacy gender gap was measured as the ratio of female-to-male literacy levels. This gap narrows as the ratio becomes larger. A time lag of at least 10 years was in effect, that became evident when the per capita GNP growth corresponding to 1980-89 was regressed against the literacy gender gap of 1970.

Results also showed that the estimated coefficient for the OPEC intercept shifter, D_{2i}, was negative at a statistically significant level in regressions (5). This finding could indicate that in spite of the positive relationship of narrowing gender gap to economic growth, some factor or factors inhibited the per capita GNP growth in OPEC countries during 1980 to 1989. In contrast, the estimated coefficient for the EAC dummy, D_{3i}, was positive at a statistically

significant level in the same regression. This finding could indicate that in addition to literacy level, some factor or factors have stimulated the per capita GNP growth in these countries.

B. The Relationship of Enrollment Gender Gap to Economic Growth

Equations (2) and (3) were used to analyse the relationship of enrollment gender gap to per capita GNP growth. As a reminder, the enrollment gender gap was measured as the ratio of female-to-male enrollment rates. This gap narrows as the ratio becomes larger. Equation (2) used natural units of the income growth and the gender gap ratios whereas, equation (3) was in linear-log form and used logarithm values of the gaps.

In Tables 1 and 2 the results of the estimated regressions using equation (2) are presented. Table 1 is for the primary level and Table 2 is for the secondary level of education. Tables 1 and 2 each contain eight regressions that are divided into four sets of two regressions. Each set in turn corresponds to the gender gaps of 1950, 1955, 1960, and 1965. In the first regression of each set only the explanetary variable of enrollment gender gap is used. In the second regressions, however, in addition to the gender gap, the dummy variables for OPEC and EAC are included.

The results presented in Tables 3 and 4 corresponds to the results presented in Tables 1 and 2, respectively -- with the exception that in Tables 3 and 4, equation (3) is used in a linear-log form. Comparing the results of Table 1 with those of Table 3, Table 1 has better statistical results. That is, at the primary level overall better results are obtained when linear regression model were used. Comparing the results of Table 2 to those of Table 4 showed, however, that at the secondary level, the linear-log results (in Table 4) are statistically better than those estimated by the linear model. Therefore, the results of Tables 1 and 4 are considered for the discussion on primary and secondary levels, respectively.

In Table 1, all the estimated regressions and their estimated partial coefficients for gender gap, G_{ci}, and respectively OPEC and EAC dummies, D_{2i} and D_{3i}, are statistically significant. Three of the regressions, however, are also with significant Durbin-Watson statistics, among which are the regressions 3 and 4 that belong to 1955. From the estimated results in Table 1 the positive relationship of narrowing enrollment gender gap at primary level to per capita GNP growth is evident. On the basis of Durbin-Watson statistics, however, regressions 3 and 4 that belong to 1955 can be relied on more. Given that the per capita GNP growth corresponds to years 1980-1989, an approximate 25 years time lag in the gender gap to income growth relationship could have been in effect.

Results in Table 1 also showed that the estimated coefficients for the OPEC intercept shifters, D_{2i}, were all negative. These findings could indicate that in spite of the positive relationship of narrowing gender gap to economic growth, some factor or factors inhibited the per capita GNP growth in OPEC during 1980 to 1989. In contrast, the estimated coefficients for the EAC dummy, D_{3i}, were positive in the same regressions. These findings could indicate that in addition to narrowing gender gap ratio, some factor or factors have stimulated the per capita GNP growth in these countries.

In Table 4, as they were in Table 1, all of the regressions and all of the estimated partial coefficients for gender gap, G_{ei}, and respectively OPEC and EAC dummies, D_{2i} and D_{3i}, are statistically significant. From the estimated results in Table 4 the positive relationship of narrowing enrollment gender gap at secondary level to per capita GNP growth can be concluded. Among the regressions with dummy variables in Table 4, regressions 5 and 6 that belong to 1960 have a statistically significant Durbin-Watson statistics. Here a time lag of 20 years is apparent in the relationship of narrowing gender gap to per capita GNP growth of years 1980-1989. The results in Table 4 (for secondary level) give similar results on the relationship of OPEC and EAC dummies to income growth as did the results in Table 1 (for primary level). That is, OPEC has had negative and EAC positive impact on the intercept of the estimated relationship of narrowing secondary enrollment gender gap to economic growth.

CONCLUSIONS

In this cross-country analysis, the relationship of narrowing literacy gender gap, measured as the ratio of female-to-male literacy levels, G_{li}, to per capita GNP growth was estimated to be positive and statistically significant. The relationship of narrowing gender gap of either primary or secondary enrollment ratios, measured as the ratio of female-to-male enrollment rates, G_{ei}, to per capita GNP growth was also positive and significant (see Tables 1 and 4). These results are consistent with the results of the other studies such as World Bank (1993, p. 47) and Hill and King (1993, pp. 14-20).

Dummy variables of D_{2i} and D_{3i} for OPEC and EAC were respectively included into the models in order to estimate the possible shifts in the intercepts of the same regressions of Tables 1 and 4. The estimated coefficients for D_{2i} were negative and statistically significant in all of the regressions . In contrast, the estimated coefficients for D_{3i} were positive and significant. This finding may indicate that in spite of the positive relationship of narrowing literacy, and primary and secondary enrollment gender gaps, on per capita GNP growth, some factor or factors have inhibited economic growth in OPEC countries during 1980-1989; likewise, some factor or factors stimulated the growth in the EAC.

This study, besides enhancing the findings of previous studies on narrowing education gender gap, suggests further research on the possible socio-economic factors that might have inhibited the income growth in OPEC countries.

FOOTNOTES

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[2] Education, in this study, is referred to in its broad sense without differentiating between general education and vocational training. For the difference see, for example, Singer (1976 pp. 399-400).

[3] For some explanation on the factors affecting gender gap in Saudi Arabia and Kuwait, two of the OPEC countries, see El-Sanabary (1993, PP 136-174)

[4] Despite significant progress in extending educational opportunities to more and more East Asian girls and women, being female is still a disadvantage (Tilac, 1993, PP 251).

[5] The ninety nine countries included: Africa: Algeria, Benin, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, C"te d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Guinea-bissau, Kenya, Lesotho, Libyan Arab Jamahiriya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Togo, Tunisia, Uganda, United Republic of Tanzania, Zaire, Zambia, Zimbabwe; North America: Bahamas, Barbados, Belize, Canada, Costa Rica, Dominica, Dominican Republic, El Salvador, Grenada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Panama, Saint Christopher and Navis, Saint Lucia, Saint Vincent and the Grenadines, Unites States; South America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Uruguay, Venezuela; Asia: Bahrain, Bangladesh, China, Cyprus, Hong Kong, India, Indonesia, The Islamic Republic of Iran, Israel, Japan, Jordan, Kuwait, Lao People's Democratic Republic, Malaysia, Nepal, Pakistan, Philippines, Republic of Korea, Saudi Arabia, Singapore, Sri Lanka, Syrian Arab Republic, Thailand, Turkey, and United Arab Emirates.

When this list used for the regressions of equation (1), the following countries were excluded: Cape Verde, Comoros, South Africa, Swaziland, Gambia, Mauritania, Sao Tome and Principe, Bahamas, Cyprus, and China.

And when used for the regressions of equations (2), and (3) in Tables 1, 2, 3, and 4, the following countries were excluded: Benin, Zaire, Guyana, Lao People's Democratic Republic, Sri Lanka, and United Arab Emirates. European countries were not included in this study because the Reimers and Tiburcio's list lacked them.

[6] This value is statistically inconclusive. That is, no decision can be made with regard to existence of autocorrelation. Regression (5) was also run in linear-log form. By doing this Durbin_Watson statistics improved but stayed inconclusive.

REFERENCES

El-Sanabary, Nagat (1993) "Middle East and North Africa", in Women's Education in *Developing Countries - Barriers Benefits and Policies,* edited by Elizabeth M. King and M. Anne Hill, Baltimore: The Johns Hopkins University Press, 1993, pp. 136-174.

Hill, M. A. and E. M. King, (1993) "Women's Education in Developing Countries: An Overview", in *Women's Education in Developing Countries - Barriers Benefits and Policies*, edited by Elizabeth M. King and M. Anne Hill, Baltimore: The Johns Hopkins University Press, 1993, pp. 1-50.

King, Elizabeth M. and M. Anne Hill, (1993) *Women's Education in Developing Countries - Barriers Benefits and Policies*, Baltimore: The Johns Hopkins University Press.

Rajeeve, p. v. (1990) *Economic Development of Asian Countries*, New Delhi, India: Deep and Deep Publications.

Reimers, F. and L. Tiburcio, (1993) *Education Adjustment and reconstruction: Options for Change*, A UNESCO Policy Discussion Paper, France: UNESCO Publishing.

Singer, Neil M. (1976) *Public Microeconomics an Introduction to Government Finance*, second ed., Boston: Little, Brown Company, pp. 399-400.

Tilak, Jandhyala B.G. (1989) *Education and Its Relation to Economic Growth, Poverty, and Income Distribution Past Evidence and Further Analysis*, World Bank Discussion Papers, Washington, D.C.: The World Bank.

_____ (1993) "East Asia", in *Women's Education in Developing Countries - Barriers Benefits and Policies*, edited by Elizabeth M. King and M. Anne Hill, Baltimore: The Johns Hopkins University Press, 1993, pp. 247-284.

World Bank, (1993) *The East Asian Miracle: Economic Growth and Public Policy*, A World Bank Policy Research Report, Oxford University Press.

Table 1 Estimated regression coefficients for the cross-country relationship of the natural units of female-to-male ratio of the primary enrollment rates of 1950, 1955, 1960, and 1965, OPEC, and EAC to per capita GNP growth of 1980-89, using equation (2).

	1950		1955		1960		1965	
Regression number	1	2	3	4	5	6	7	8
Explanatory variables[a]:								
G_{ei}	2.3740**	1.7592**	2.8740***	1.9989**	3.0182***	2.4175**	3.5285**	2.4027*
	(2.48)[b]	(2.01)	(2.78)	(2.05)	(2.66)	(2.27)	(2.57)	(1.90)
D_{2i}		-2.2628***		-2.8866***		-2.5055***		-2.8366***
		(-2.71)		(-2.77)		(-2.67)		(-2.88)
D_{3i}		4.0435***		2.9375**		3.3784***		3.9175***
		(3.01)		(2.45)		(2.83)		(3.56)
R^2	0.085	0.286	0.098	0.259	0.087	0.241	0.076	0.269
R^2 (adj.)	0.071	0.252	0.086	0.227	0.075	0.209	0.065	0.241
F-ratio	6.15**	8.54***	7.74***	8.03***	7.06***	7.62***	6.62**	9.59***
n_1, n_2	1,66	3,64	1,71	3,69	1,74	3,72	1,80	3,78
D-W	1.55***	1.26	1.75***	1.79***	1.50	1.48	1.38	1.46
k,n	1,68	3,68	1,73	3,73	1,76	3,76	1,82	3,82
SEE	2.8837	2.5874	2.9731	2.7344	2.9913	2.7654	3.2553	2.9051
Intercept	-1.8649***	-1.3937**	-1.9122***	-1.3096*	-2.4175***	-1.9410**	-2.4745**	-1.6886*
	(-2.77)	(-2.16)	(-2.78)	(-2.90)	(-2.83)	(-2.41)	(-2.33)	(-1.72)

* Significant at 10% level.
** Significant at 5% level.
*** Significant at 1% level.
[a] Definition of the variables are given under equations (2).
[b] Figures in parentheses are t values for the estimated coefficients.

Table 2 Estimated regression coefficients for the cross-country relationship of the natural units of female-to-male ratio of the secondary enrollment rates of 1950, 1955, 1960, and 1965, OPEC, and EAC to per capita GNP growth of 1980-89, using equation (2).

	1950		1955		1960		1965	
Regression number	1	2	3	4	5	6	7	8
Explanatory variables[a]:								
G_{ei}	1.7681	1.3884	1.8924*	1.0894	1.3029	0.9000	3.1382**	2.4008**
	(1.59)[b]	(1.40)	(1.71)	(1.07)	(1.30)	(1.02)	(3.11)	(2.60)
D_{2i}		-2.8879**		-2.8861**		-3.3166***		-2.9502***
		(-2.65)		(-2.59)		(-2.82)		(-2.89)
D_{3i}		5.2671***		4.0271***		4.0416***		3.6152***
		(3.62)		(3.23)		(3.44)		(3.18)
R^2	0.039	0.302	0.039	0.242	0.024	0.269	0.109	0.295
R^2 (adj.)	0.024	0.267	0.026	0.210	0.010	0.236	0.098	0.268
F-ratio	2.53	8.64***	2.91*	7.45***	1.69	8.10***	9.65***	10.75***
n_1, n_2	1,62	3,60	1,72	3,70	1,68	3,66	1,79	3,77
D-W	1.42	1.09	1.46	1.51	1.63***	1.80***	1.43	1.50
k,n	1,64	3,64	1,74	3,74	1,70	3,70	1,81	3,81
SEE	3.2270	2.7965	3.2268	2.9061	3.3298	2.9252	3.1560	2.8431
Intercept	-1.1409	-0.9093	-1.1153	-0.7185	-1.7650	-0.6018	-1.9342**	-1.4455**
	(-1.61)	(-1.34)	(-1.64)	(-1.09)	(-1.08)	(-0.93)	(-2.62)	(-2.08)

* Significant at 10% level.
** Significant at 5% level.
*** Significant at 1% level.
[a] Definition of the variables are given under equations (2).
[b] Figures in parentheses are t values for the estimated coefficients.

Table 3 Estimated regression coefficients for the cross-country relationship of the logarithmic value of female-to-male ratio of the primary enrollment rates of 1950, 1955, 1960, and 1965, OPEC, and EAC to per capita GNP growth of 1980-89, using equation (3).

	1950		1955		1960		1965	
Regression number	1	2	3	4	5	6	7	8
Explanatory variables[a]:								
G_{ei}	1.1178***	0.7895**	0.9393**	0.5621	1.5459**	1.1503*	1.8587**	1.1768
	(2.83)[b]	(2.15)	(2.36)	(1.48)	(2.48)	(1.95)	(2.15)	(1.49)
D_{2i}		-2.4551**		-2.8987***		-2.4631**		-2.9013***
		(-2.59)		(-2.73)		(-2.59)		(-2.93)
D_{3i}		3.9353***		3.0652**		3.3995***		3.9929***
		(2.94)		(2.55)		(2.81)		(3.59)
R^2	0.108	0.292	0.073	0.238	0.077	0.227	0.055	0.256
R^2 (adj.)	0.095	0.258	0.066	0.205	0.064	0.195	0.043	0.228
F-ratio	8.01***	8.78***	5.57**	7.19***	6.15**	7.07***	4.63**	8.97***
n_1, n_2	1,66	3,64	1,71	3,69	1,74	3,72	1,80	3,78
D-W	1.40	1.23	1.63***	1.76***	1.45	1.48	1.39	1.48
k,n	1,68	3,68	1,73	3,73	1,76	3,76	1,82	3,82
SEE	2.8471	2.5769	3.0149	2.7722	3.0084	2.7897	3.2630	2.9307
Intercept	0.4331	0.2710*	0.5351	0.3139	0.4326	0.2908	0.8290*	0.5267
	(0.94)	(0.62)	(1.15)	(0.68)	(0.93)	(0.63)	(1.68)	(1.09)

* Significant at 10% level.
** Significant at 5% level.
*** Significant at 1% level.
[a] Definition of the variables are given under equations (3).
[b] Figures in parentheses are t values for the estimated coefficients.

Table 4 Estimated regression coefficients for the cross-country relationship of the logarithmic value of female-to-male ratio of the secondary enrollment rates of 1950, 1955, 1960, and 1965, OPEC, and EAC to per capita GNP growth of 1980-89, using equation (3).

	1950		1955		1960		1965	
Regression number	1	2	3	4	5	6	7	8
Explanatory variables[a]:								
G_{ei}	0.9965**	0.7326**	1.1570**	0.7048	1.0691***	0.7343**	1.4576***	1.0851**
	(2.48)[b]	(2.01)	(2.49)	(1.60)	(3.07)	(2.26)	(2.99)	(2.42)
D_{2i}		-2.6505**		-2.6699**		-2.7866**		-3.0507***
		(-2.44)		(-2.39)		(-2.38)		(-2.99)
D_{3i}		5.1270***		3.8939***		3.8137***		3.5178***
		(3.59)		(3.14)		(3.33)		(3.06)
R^2	0.091	0.324	0.079	0.257	0.122	0.311	0.102	0.288
R^2 (adj.)	0.076	0.290	0.066	0.225	0.109	0.234	0.090	0.260
F-ratio	6.17**	9.60***	6.19**	8.06***	9.43***	9.93***	8.92***	10.37***
n_1, n_2	1,62	3,60	1,72	3,70	1,68	3,66	1,79	3,77
D-W	1.41	1.08	1.41	1.51	1.50***	1.77***	1.44	1.50
k,n	1,64	3,64	1,74	3,74	1,70	3,70	1,81	3,81
SEE	3.1397	2.7511	3.1583	2.8777	3.1591	2.8403	3.1690	2.8580
Intercept	0.07891	0.5352	0.9337	0.4846	0.9639*	0.5584	1.0150**	0.8111*
	(1.40)	(1.06)	(1.64)	(0.90)	(1.96)	(1.18)	(2.15)	(1.77)

* Significant at 10% level.
** Significant at 5% level.
*** Significant at 1% level.
[a] Definition of the variables are given under equations (3).
[b] Figures in parentheses are t values for the estimated coefficients.

APPENDIX

Appendix: The Means and Standard Deviations for Per Capita GNP Growth, Literacy Level, Enrollment Rates, and Female-to-Male Literacy and Enrollment Ratios (Gender Gaps).

The related means and standard deviations for the sample used for the literacy gender gap analysis are shown in Table A1.

Table A1 Mean and Standard Deviation of Per Capita GNP Growth, Q_i; Literacy Levels, and Literacy Gender Gap, G_{li}, for the Sample Countries[1] Used for Estimations of Equation (1).

	Growth in per capita income 1980-1989, Q_i, (%)	Literacy level, 1970		F/M literacy level, G_{li},
		Female (%)	Male (%)	
Total sample:				
Mean	-0.14	43.23	57.99	0.63
Standard Deviation	3.23	33.41	27.70	0.31
Number of Observation	89	89	89	89
OPEC:				
Mean	-2.51	29.80	52.20	0.49
Standard deviation	3.59	24.53	20.04	0.27
Number of observation	10	10	10	10
EAC:				
Mean	3.99	67.50	83.88	0.79
Standard deviation	3.11	19.43	11.43	0.14
Number of observation	8	8	8	8

[1] Name of the countries as mentioned under equation (1)

The related means and standard deviations for the samples used for enrollment gender gap analysis are shown in Table A2.

Table A2 Mean and Standard Deviation (SD) of Per Capita GNP Growth, G_i, Enrollment Rates, and Enrollment Gender Gap, G_{ei}, for the Sample Countries[1] Used for Estimations of Equations (2) and (3).

	Growth in per capita income 1980-1989, Q_i, (%)	Enroll. rate		F/M enroll. rate, G_{ei},	Growth in per capita income 1980-1989, Q_i, (%)	Enroll. rate		F/M enroll. rate, G_{ei},
		Female (%)	Male (%)			Female (%)	Male (%)	
		.....1950.....				.....1955.....		
Primary level:								
Total sample:								
Mean	-0.44	42.35	57.04	0.60	-0.18	46.98	64.38	0.60
SD	2.99	38.66	36.31	0.37	3.11	40.56	37.05	0.34
No. of obs.:	68	68	68	68	73	73	73	73
OPEC:								
Mean	-3.19	25.68	49.21	0.44	-3.30	31.14	58.86	0.45
SD	3.05	23.99	30.00	0.33	3.24	28.03	33.91	0.26
No. of obs.:	9	9	9	9	8	8	8	8
EAC								
Mean	3.90	65.13	91.13	0.71	3.25	73.13	90.33	0.81
SD	1.61	25.72	14.96	0.24	2.86	19.79	16.16	0.17
No. of obs.:	4	4	4	4	6	6	6	6
Secondary level:								
Total sample:								
Mean	-0.21	6.15	8.65	0.53	-0.15	8.33	12.89	0.51
SD	3.27	13.46	14.48	0.37	3.27	14.40	15.97	0.34
No. of obs.:	64	64	64	64	74	74	74	74
OPEC:								
Mean	-3.36	1.73	3.57	0.31	-3.26	2.83	7.50	0.31
SD	3.21	2.31	3.04	0.28	3.25	2.98	4.53	0.25
No. of obs.:	8	8	8	8	8	8	8	8
EAC:								
Mean	4.98	19.13	30.13	0.44	3.97	25.50	38.17	0.60
SD	2.99	29.99	33.07	0.27	3.66	25.06	23.74	0.24
No. of obs.:	4	4	4	4	6	6	6	6

[1] Name of the countries as mentioned under equation (2)

Table A2. Continued . . .

Table A2 Continued . . .

	Growth in per capita income 1980-1989, Q_i, (%)	Enroll. rate Female (%)	Enroll. rate Male (%)	F/M enroll. rate, G_{ei},	Growth in per capita income 1980-1989, Q_i, (%)	Enroll. rate Female (%)	Enroll. rate Male (%)	F/M enroll. rate, G_{ei},
		.....1960.....				.....1965.....		
Primary level:								
Total sample:								
Mean	-0.34	56.24	73.25	0.69	0.10	65.77	84.32	0.73
SD	3.11	39.88	35.25	0.30	3.34	37.28	33.29	0.26
No. of obs.:	76	76	76	76	82	82	82	82
OPEC:								
Mean	-2.51	53.10	77.50	0.66	-2.51	63.20	88.80	0.68
SD	3.59	33.76	39.15	0.30	3.59	35.47	35.31	0.23
No. of obs.:	10	10	10	10	10	10	10	10
EAC								
Mean	3.10	82.67	95.67	0.86	3.99	88.75	101.25	0.88
SD	2.81	19.25	17.84	0.10	3.11	18.93	14.40	0.15
No. of obs.:	6	6	6	6	8	8	8	8
Secondary level:								
Total sample:								
Mean	0.00	10.01	15.89	0.58	0.08	15.85	21.46	0.64
SD	3.35	13.22	16.68	0.40	3.32	16.80	17.47	0.35
No. of obs.:	70	70	70	70	81	81	81	81
OPEC:								
Mean	-3.47	8.75	16.97	0.50	-3.19	12.78	21.67	0.50
SD	3.45	10.06	16.69	0.45	3.05	14.64	16.85	0.28
No. of obs.:	7	7	7	7	9	9	9	9
EAC:								
Mean	4.04	26.21	35.93	0.67	4.04	35.86	43.71	0.78
SD	3.35	23.73	22.26	0.21	3.35	24.13	23.12	0.15
No. of obs.:	7	7	7	7	7	7	7	7

[1] Name of the countries as mentioned under equation (2)

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